GROW GREAT

October 2021

NUTRITIONAL STATUS OF CHILDREN UNDER FIVE

IN MQANDULI, EASTERN CAPE, SOUTH AFRICA

in collaboration with Philani and Nelson Mandela University

PHILANI
Maternal, Child Health and Nutrition Trust
Healthy mothers raising healthy children

NELSON MANDELA UNIVERSITY

ACKNOWLEDGEMENTS

The Grow Great Campaign would like to thank Nelson Mandela University, in particular Professor Annelie Gresse, who partnered with the Campaign on this research. In addition, thanks go to Philani Maternal, Child Health and Nutrition Trust for their support with local stakeholder engagement and making their Community Health Workers available to support in-field data collection and supervision. We also thank all the participants for their time.

Matlwa Mabaso K, Menyatsoe M, Manda, S, Müller A, Gresse A.
Nutritional status of children under five in Mqanduli, Eastern Cape Province, South Africa.
Johannesburg: Grow Great Campaign; September 2021. p.62

ABBREVIATIONS

CHW	Community Health Worker
CI	Confidence Interval
CSG	Child Support Grant
DDS	Dietary Diversity Score
DHIS	District Health Information System
HAZ	Height/Length-for-Age z-score
IQR	Interquartile Range
LBW	Low Birth Weight
MAM	Moderate Acute Malnutrition
MUAC	Mid-Upper Arm Circumference
NIDS	National Income Dynamics Study
OR	Odds Ratio
SADHS	South Africa Demographic Health Survey
SAM	Severe Acute Malnutrition
SANHANES	South African National Health and Nutrition Examination Survey
SD	Standard Deviation
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WAZ	Weight-for-Age z-score
WHO	World Health Organization
WLZ	Weight-for-Length z-score

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EXECUTIVE SUMMARY

Grow Great is a campaign that seeks to mobilise South Africa to commit to zero stunting by 2030. Stunting is a result of prolonged undernutrition and exposure to repeated infections at the beginning of a child's life, perpetuated by factors at the household, community and societal level.

By investing in nutrition and reducing stunting, South Africa will be able optimise what we can achieve from our investments and other development work in education, health and youth unemployment. Ignoring the burden of stunting undermines the development interventions we already have in place, as well as efforts to reduce inequality.

In other settings with high rates of stunting, interventions that target women of reproductive age and young children, emphasising the important first 1000 days of a child's life, have made noteworthy reductions. In one such setting, the Indian state of Maharashtra, evidence suggests that through collecting and disseminating high-quality data on the prevalence of child malnutrition, communities were mobilised to hold their government accountable to bring change. This led to multi-sectoral responses and actions, and ultimately to meaningfully addressing malnutrition.

In the absence of good quality data, in part due to small sample sizes and infrequent national surveys, South Africans are not able to mimic their Indian counterparts and yield similar results in local communities. In response to this, Grow Great's strategy includes data-driven advocacy through surveying a selection of high burden communities across the country.

This report presents and describes findings from a study in one such setting, Mqanduli in the Eastern Cape. The study set out to respond to two objectives: firstly, to describe the prevalence of stunting of children under five years of age in Mqanduli and surrounding villages by means of a cross-sectional survey; secondly, to collect data on evidence-based drivers of stunting to inform locally relevant intervention design. The results section *(from page 14)* includes descriptive statistics of key indicators and predictor variables of stunting, namely socio-economic markers and health factors, followed by the estimates of association between child stunting and a set of predictor variables using logistic regression analyses.

Among the 1431 children surveyed whose mothers were 18 years or older, stunting was identified in 336 children (of whom 94 were severely stunted). The prevalence of stunting was 24% (95% confidence interval (CI) [21%-26%]). This is slightly lower than the

Eastern Cape provincial estimate of 25% and below the national estimate of 27%. Assessing one risk factor at a time, we found that male sex, inadequate access to sanitation, not having a birth certificate by age five, not receiving a Child Support Grant (CSG) by age five, having a low birth weight, being identified with either moderate acute malnutrition or severe acute malnutrition, underweight or obesity were statistically significant risk factors for stunting.

Factors that were associated with a protective effect against stunting were maternal education attainment and the child's age being younger than 24 months. However, when all the factors were considered in a multivariate logistic model, only underweight (adjusted OR=16.97, 95% CI [3.55-81.11]) remained predictive of stunting. Having reportedly had diarrhoea in the past two weeks, counterintuitively emerged as protective of stunting (adjusted OR: 0.20, 95% CI [0.05-0.83]).

We conclude that children in this setting have poor access to adequate water and sanitation, known risk factors for diarrhoea and stunting. Given the evidence that a combination of interventions, including improving water and sanitation, access to nutritious food and behaviour change support are necessary to improve child growth outcomes, reducing stunting in this setting requires a multisectoral response. Furthermore, underweight is a significant predictor of stunting in this setting. This condition can be diagnosed and treated at the community level; therefore, Community Health Worker (CHW) programmes should be strengthened to ensure that children in the Mqanduli area are routinely growth monitored and benefit from basic preventative primary healthcare services. Due to evidence of the double burden of under- and overnutrition among children in this setting, we recommend that double-duty interventions are scaled up.

Given the high levels of unemployment and food insecurity brought on by the Covid-19 pandemic, we expect that the nutrition profile of children under five in Mqanduli and surrounding villages will have further deteriorated. Given the lifelong impact of poor nutrition and stunting, this community should call for interventions that speak to both the direct and indirect causes of malnutrition.

1. INTRODUCTION

Stunting, defined by a height-for-age z-score more than two standard deviations below the World Health Organization's (WHO) child growth standards median[1] is a condition where young children do not reach their growth potential.

This nutritional disorder is directly caused by chronic nutritional deprivation, repeated infections or disease, and lack of psychosocial stimulation. Indirectly, it is caused by structural barriers to good nutrition, such as food insecurity, poor access to water and sanitation, inadequate healthcare, poverty and inequality due to chronic nutritional deprivation, repeated infections and poor psychosocial stimulation.[1,2] Stunting is associated with lifelong cognitive defects, educational and employment challenges, increased risk of chronic diseases in adulthood and cycles of intergenerational poverty.[3] The importance of addressing stunting is increasingly on the global development agenda: for example, Sustainable Development Goal 2.2 calls on all countries to meet the internationally agreed targets on stunting and wasting for all children under five by 2025. The World Health Assembly global targets for 2025 include reducing stunting by 40% in children under age five and increasing to at least 50% the rate of exclusive breastfeeding in the first six months.[4]

The prevalence of stunting among South Africa's children is worryingly high, with prevalence rates estimated at 27% for children under five[5] – far higher than would be expected for an upper

middle-income country and far higher than many of South Africa's developing country counterparts.[6] An evaluation of nutrition interventions in South Africa found comparatively poor performance in terms of improving nutrition outcomes such as stunting.[7] In fact, according to the United Nations Children's Fund (UNICEF), South Africa is one of the 10 countries that accounts for 80% of the stunting burden in the region.[8]

An up-to-date, comprehensive picture of the nutritional status of South Africa's children remains elusive.[9] When detailed data are collected through national surveys like the South African National Health and Nutrition Survey (SANHANES), the South African Demographic and Health Survey (SADHS) and the National Income Dynamics Study (NIDS), data collected on dietary intake and food security are limited, not representative of the population or they are collected at intervals that are too irregular.[9] Data on childhood nutrition indicators, such as stunting, remain hampered by unreliable provincial estimates emanating from employing small samples in national surveys, making it difficult to determine the extent of stunting at provincial and district levels, as well as inequalities that may exist across geographies.[5] In addition, height-for-age data collected from primary healthcare clinics are not reported in the District Health Information System (DHIS), making sophisticated assessments of the prevalence of stunting in South Africa – and how it is evolving over time across districts and provinces – challenging.

The availability of quality nutritional data has significant benefits, including informing early identification and treatment for poor physical growth; driving informed, responsive and timely government decisions on nutrition service delivery; and improving the ability of communities to hold government accountable for the quality and effectiveness of its investments in nutrition. In the Indian state of Maharashtra, stunting reduced from 39% in 2006 to 22.8% in 2012.[10] It has been argued that it was through the collection and dissemination of high-quality data on the prevalence of malnutrition in children under six in Maharashtra – and the public outcry that followed – that resulted in state-level action and multi-sectoral responses that addressed the problem of malnutrition.[10] This research aims to create a similar profile of the nutritional status of children under five in the vulnerable communities in Mqanduli and surrounding villages in the Eastern Cape, South Africa.

2. METHODOLOGY

2.1. AIM

The aim of this study was to profile the nutritional status of children under five years old in Mqanduli and surrounding villages in the Eastern Cape.

2.2. OBJECTIVES

The objectives of this study were to:

a. *determine the prevalence of stunting in children under five in Mqanduli and surrounding villages; and to*
b. *determine the drivers of stunting in children under five in Mqanduli and surrounding villages.*

2.3. STUDY DESIGN

2.3.1. METHODS AND SETTING

A descriptive cross-sectional study design was employed in Mqanduli and surrounding villages. Mqanduli is a town in the OR Tambo District Municipality in the Eastern Cape. According to the 2020 Child Poverty report published by Statistics South Africa, 78.7% of children under 18 in the Eastern Cape are multidimensionally poor i.e. being deprived in at least three out of seven dimensions of wellbeing.[11] Thirty-five percent (35%) of households in the Eastern Cape cited social grants as their main source of income in the 2018 General Household Survey.[12] The local municipality (King Sabata Dalindyebo) is listed as one of six poorest performing areas in the country for early antenatal visits, neonatal deaths in facilities rate, pneumonia case fatality rate and number of deaths due to severe acute malnutrition (children under five years old).[13] It is a predominantly rural area with an increasingly high unemployment rate (44.7%).[14]

2.3.2. POPULATION

The study population of interest was children under five living in the above-mentioned areas and their primary caregiver.

2.3.3. SAMPLING STRATEGY

The villages included in the study were based on recommendations from local government officials, based on

their knowledge of the area and understanding of where the greatest density of households could be found. Starting points in the selected areas were chosen based on convenience. Once a starting point was selected, all households in that particular area were surveyed.

2.3.4. INCLUSION AND EXCLUSION CRITERIA

The following inclusion and exclusion criteria were applied:

Inclusion criteria

- *Households with children between the ages of 0 to 60 months*

Exclusion criteria

- *Households without children between the ages of 0 to 60 months, or*
- *Households where the mother or caregiver did not provide consent, or*
- *Households where the mother or caregiver was below the age of 18 years*

2.3.5. DATA COLLECTION

Data were collected by Philani Maternal, Child Health and Nutrition Trust (Philani) Mentor Mothers i.e. Community Health Workers (CHWs) contracted to Philani. These CHWs were trained on the questionnaire by the Grow Great team and Philani provided refresher training on anthropometric measurement. In-field supervision and quality assurance were provided by a Philani supervisor who rotated between pairs of CHWs, ensuring that anthropometric measurements were correctly obtained and CHWs were following standard operating procedures. A pilot study was conducted in February 2019 to test the study tools. Data collection took place between June and August 2019.

2.3.6. DATA ANALYSIS

Data were captured in Microsoft Excel and analysed in STATA version 16.0. The WHO definitions for child growth standards and cut-offs, *as defined in Table 1*, were used to calculate standard growth measures and indicators on binary scales. For example, height-for-age was calculated by comparing a child's height/length at a given age to a median of a reference population. Then a child height-for-age z-score was taken as the difference between the height and the median, divided by the standard deviation of the reference at that age. A child whose score is below -2 z-score was considered stunted. Preliminary statistical analyses for continuous data involved obtaining means (with standard deviation (SD)) or as median and interquartile ranges (IQR) for skewed distributions. Discrete or categorical data were summarised using frequencies and percentages.

Associations between various stunting and potential predictors were quantified by odds ratios (ORs) with 95% confidence intervals (CI) and p-values. Predictor variables were selected based on other studies and research experience. All predictors with a Wald score greater than 15 or significance level (p-value) < 0.25 were included in the initial multivariate logistic regression analyses to model stunting. Factors from the multivariate logistic regression that had odds ratios that were exceedingly large or demonstrated the possibility of collinearity were eliminated.

2.3.7. ETHICS CONSIDERATIONS

Ethics approval was obtained from the Human Research Ethics Committee of Nelson Mandela University (Reference number: H19-HEA-DIET-003). Voluntary, written informed consent was obtained from all study participants. CHWs were trained to refer any children who were acutely unwell or requiring medical support or social support. Questionnaires were stored securely by study leaders and personal identifiers were anonymised in the database used for analysis. All participating households received reading material for the child as a token of appreciation for their participation.

TABLE 1

WHO CHILD GROWTH STANDARDS AND CUT OFFS

Z-SCORE	CLASSIFICATION
LENGTH/HEIGHT-FOR-AGE (LAZ/HAZ)	
<-2 z-score	Stunted
<-3 z-score	Severely stunted
WEIGHT-FOR-AGE(WAZ)	
<-2 z-score	Underweight
<-3 z-score	Severely underweight
WEIGHT-FOR-LENGTH/HEIGHT (WLZ/WHZ)	
>3 z-score	Obese
>2 z-score	Overweight
<-2 z-score	Wasted
<-3 z-score	Severely wasted

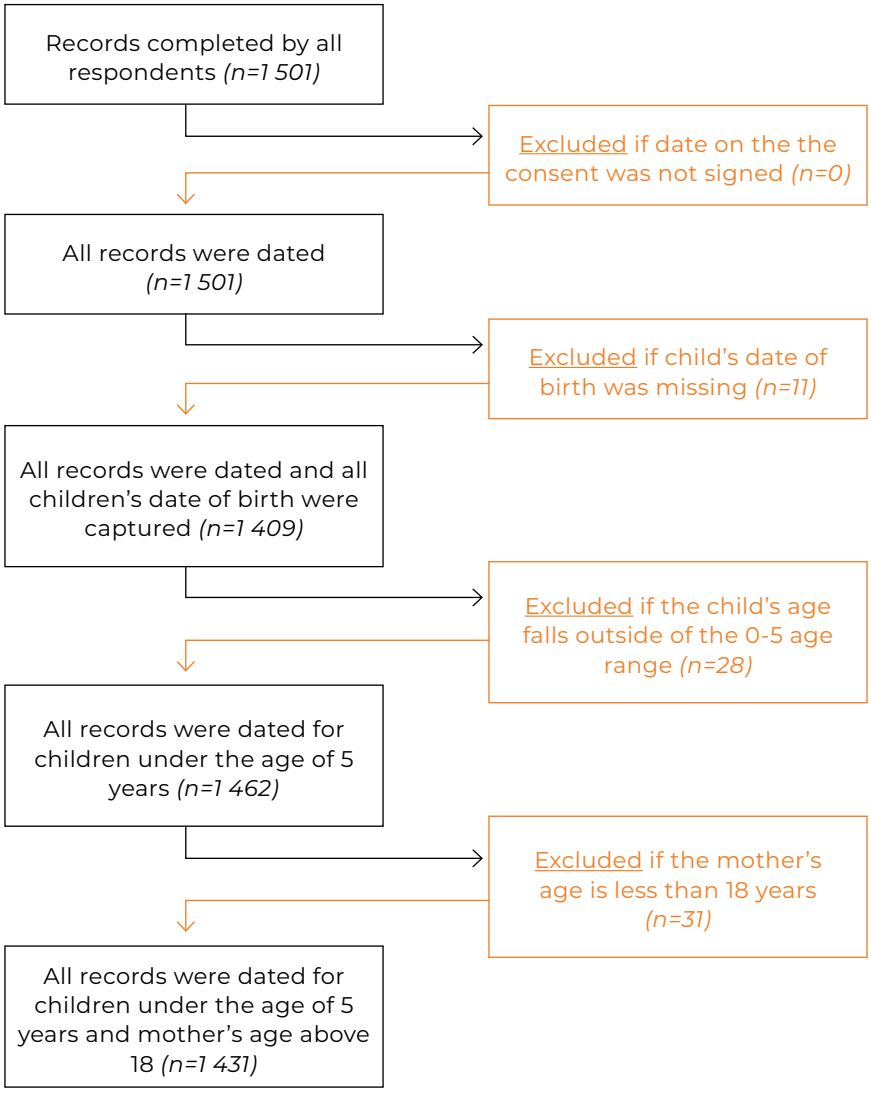
3. RESULTS

A total of 1501 questionnaires were completed by CHWs. Questionnaires that were found to have consent forms not signed by the study participant, child's date of birth missing, anthropometry only conducted by a single CHW instead of the required two, children greater than five years of age or primary caregivers who were younger than 18 at the time of data collection, were all excluded from the analysis.

Of the 1501 completed questionnaires, 11 had a child's date of birth missing, 28 fell outside the age range and 31 mothers were under the age of 18 years. As a result, only 1431 were included in the final analysis. *See Figure 1 for more detail.*

Figure 1

RECORDS INCLUDED FOR ANALYSIS



3.1. SOCIO-DEMOGRAPHIC INFORMATION

3.1.1. STUDY AREAS

Of the 1431 participants, 31% resided within the drainage area of Mqanduli clinic (n=433), followed by Mpunzana (21%; n=298), Mbekweni (16%; n=224) and Ntlangaza (11%; n=157). *See Figure 2.*

3.1.2. MOTHER'S AGE

The mean age of mothers included in the study was 28.8 years, with the youngest mother aged 18 and the eldest aged 53 years. Most of the mothers in this study belong to the 25 to 34 age group *as illustrated in Figure 3.*

3.1.3. MATERNAL EDUCATION

Where the mother of the child was present to participate in the survey, only 8% (n=59) reported attending further education after high school. *See the distribution in Figure 4.*

3.1.4. CHILD'S AGE

The mean age of the children under five included in the study was 29.81 months, with the youngest child aged 13 months and the eldest aged 59.97 months. Nearly two-thirds (n=853, 60%) of the children included in this study were over the age of two years, *as illustrated in Figure 5.*

3.1.5. CHILD SEX

Fifty-four percent (54%) of children included in the study were boys (n=769), and 46% were girls (n=662), *as illustrated in Figure 6.*

Figure 2

STUDY AREAS *(n=1 431)*

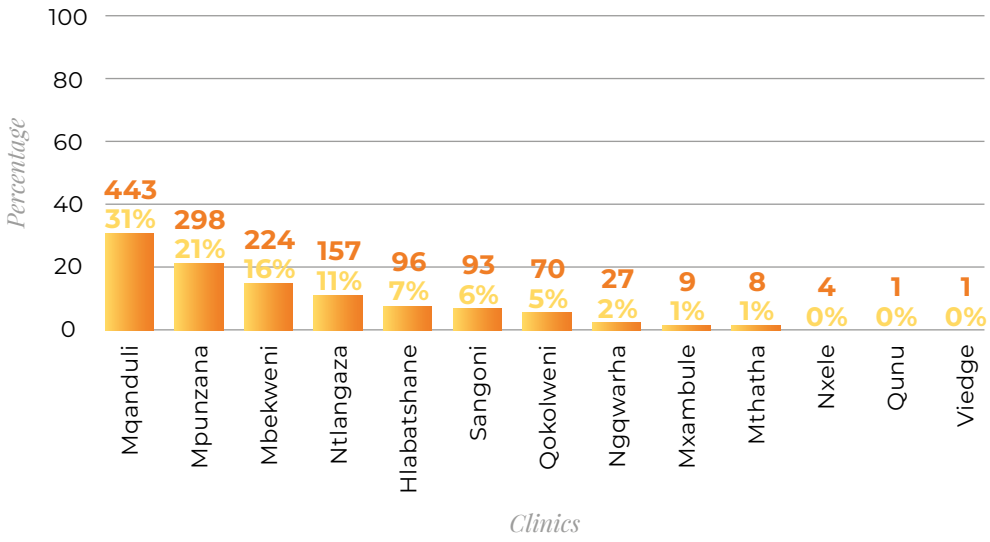


Figure 3

MOTHERS' AGE *(n=1 414)*

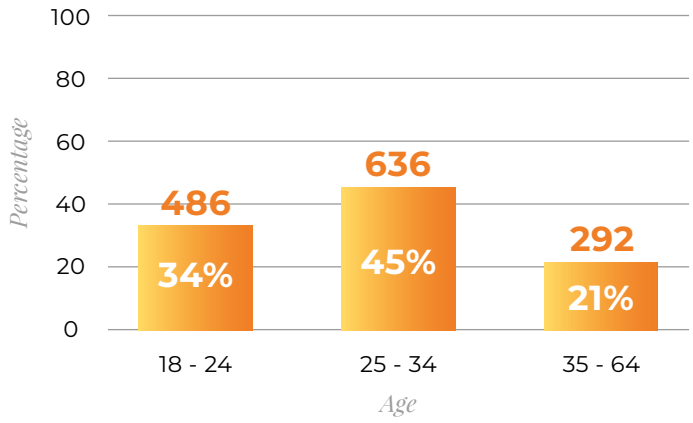


Figure 4

MATERNAL EDUCATION *(n=730)*

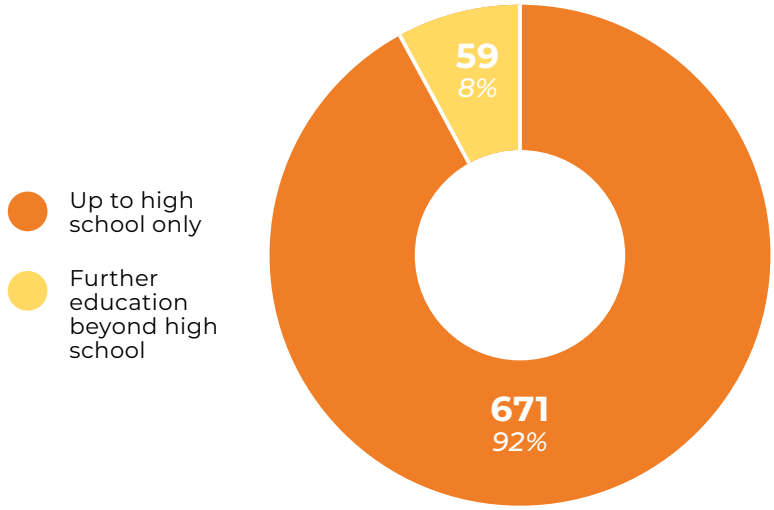


Figure 5

CHILDREN UNDER THE AGE OF FIVE YEARS *(n=1 431)*

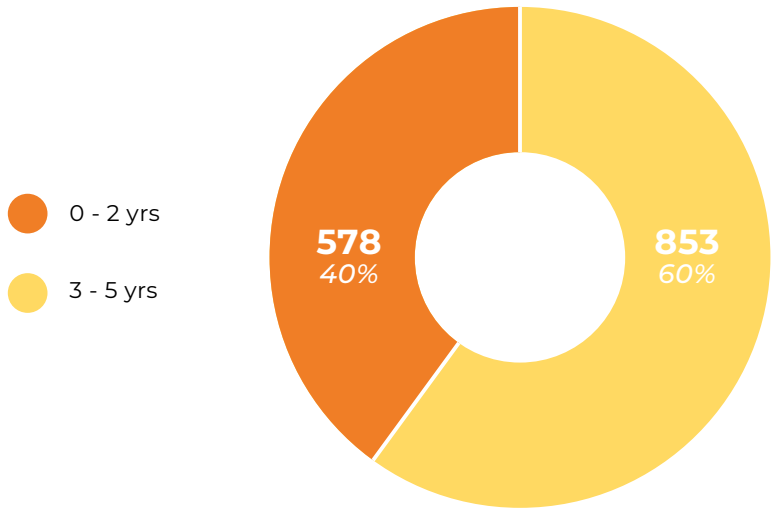
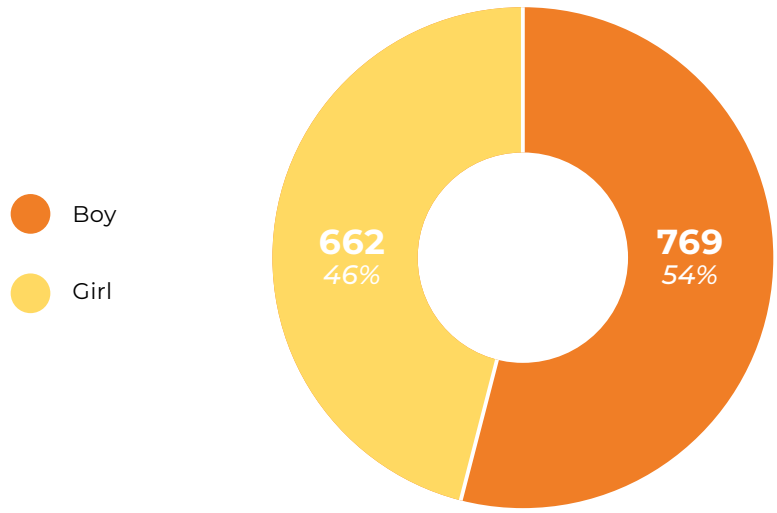


Figure 6

CHILD'S SEX *(n=1 431)*



3.2. ACCESS TO BASIC SERVICES

3.2.1. SOURCE OF DRINKING WATER

The majority of caregivers (n=783; 55%) collected water from a dam, river or spring. Of the remainder, 38% (n=542) accessed communal water and 7% (n=105) rain water. One study participant reported obtaining water from 'other sources'; it is unclear what these other sources were. None of the study participants had piped water in their home. *See Figure 7* for a graphic representation of the source of access to drinking water.

3.2.2. SOURCE OF SANITATION

Most children (n=1038, 72%) lived in households whose primary source of sanitation was a ventilated pit latrine. Twenty-four percent (n=339) made use of a pit latrine or long drop; 3% (n=37) had no access to sanitation facilities and 1% (n=14) used portable toilets. *Figure 8 shows* the sources of sanitation households had access to.

Figure 7

MAIN SOURCE OF DRINKING WATER *(n=1 431)*

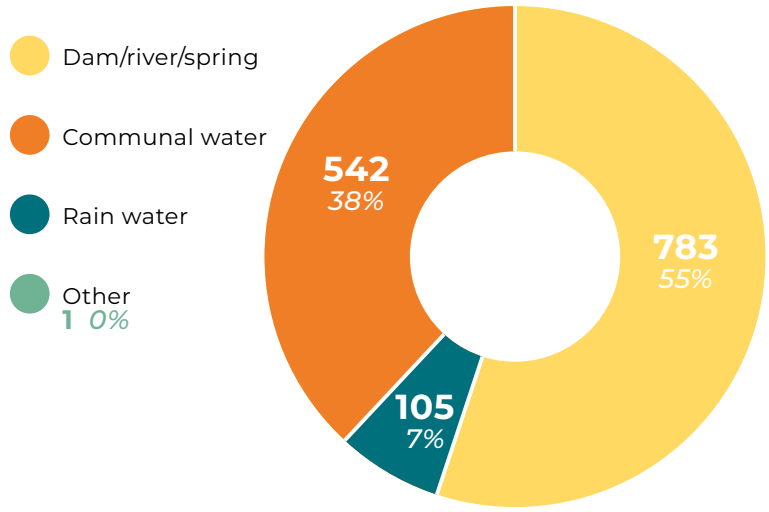
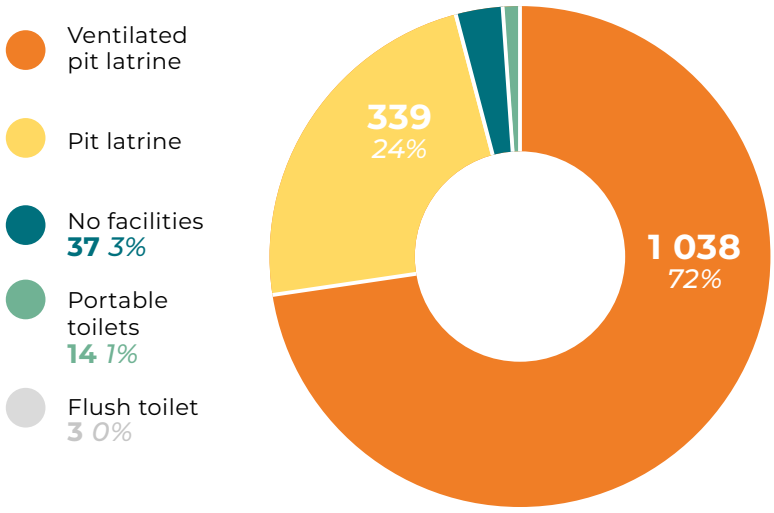


Figure 8

MAIN SOURCE OF SANITATION *(n=1 431)*



3.3. CHILD HEALTH AND NUTRITION

3.3.1. VITAMIN A SUPPLEMENTATION

Of the 1120 children (77%) older than six months included in this study, 27% (n=302) had no record of receiving their most recent Vitamin A dose.

3.3.2. DEWORMING

Of the 1137 (77%) children older than one year included in this study, only 306 (27%) were found to have an up-to-date deworming schedule, *as illustrated in Figure 10.*

3.3.3. EXCLUSIVE BREASTFEEDING

Only 37% (n=44) of children under six months included in the study were reportedly exclusively breastfed at the time of this research. *Figure 11 illustrates* the distribution of exclusive breastfeeding status.

3.3.4. CHILD'S DIETARY DIVERSITY

The dietary diversity questionnaire is a validated tool to measure the nutrient adequacy of populations. We analysed the mean dietary diversity score (DDS) of children aged six months to 23 months, as this is the age of vulnerability to malnutrition when children transition from breastfeeding to the household diet.[15] The mean DDS for children aged six to 23 months in this study was found to be 3.66. Of the 458 children aged six to 23 months, 43% (n=195) had an inadequate dietary diversity score (i.e. a score less than 4).

3.3.5. DIARRHOEA

Five percent (n=71) of the children included in the study were reported to have had diarrhoea in the two weeks preceding the survey.

Figure 9

RECORD OF MOST RECENT VITAMIN A DOSE
AMONG CHILDREN AGED SIX TO 59 MONTHS *(n=1 120)*

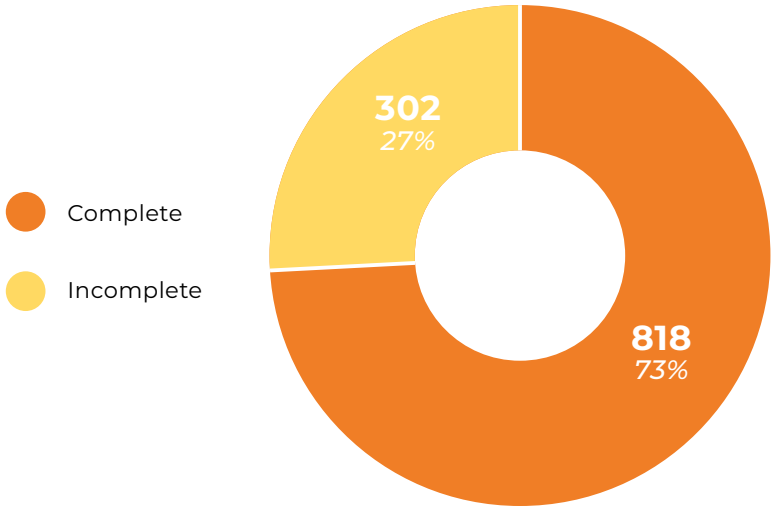


Figure 10

DEWORMING FOR CHILDREN AGED ONE TO FIVE YEARS *(n=1 137)*

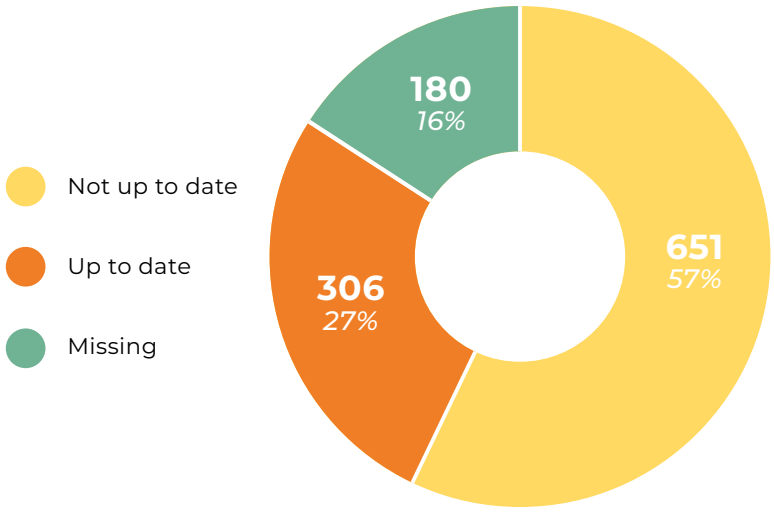


Figure 11

EXCLUSIVE BREASTFEEDING FOR CHILDREN UNDER SIX MONTHS *(n=120)*

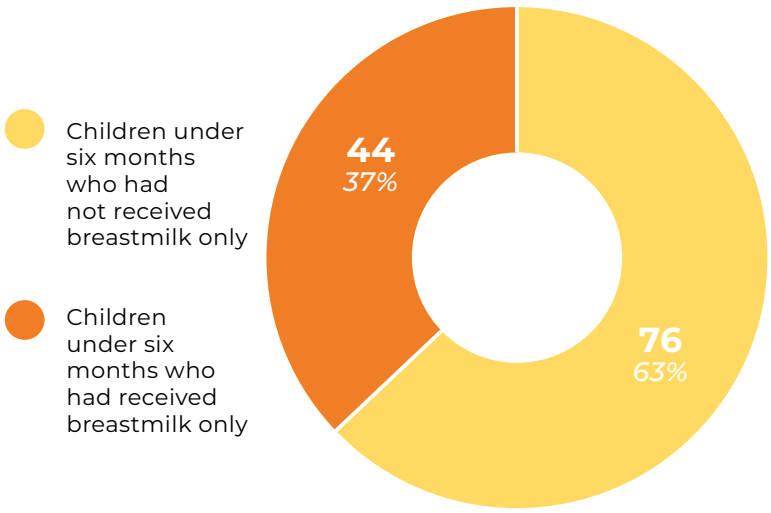


Figure 12

DIETARY DIVERSITY FOR CHILDREN BETWEEN SIX AND 23 MONTHS OLD *(n=458)*

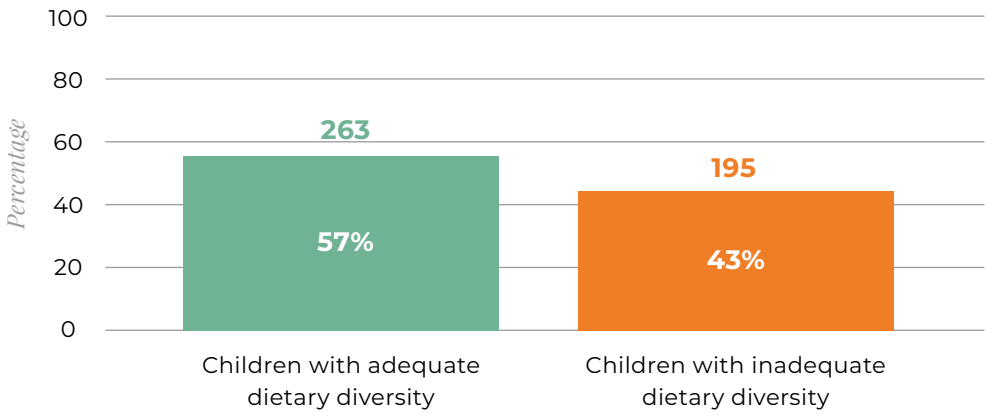
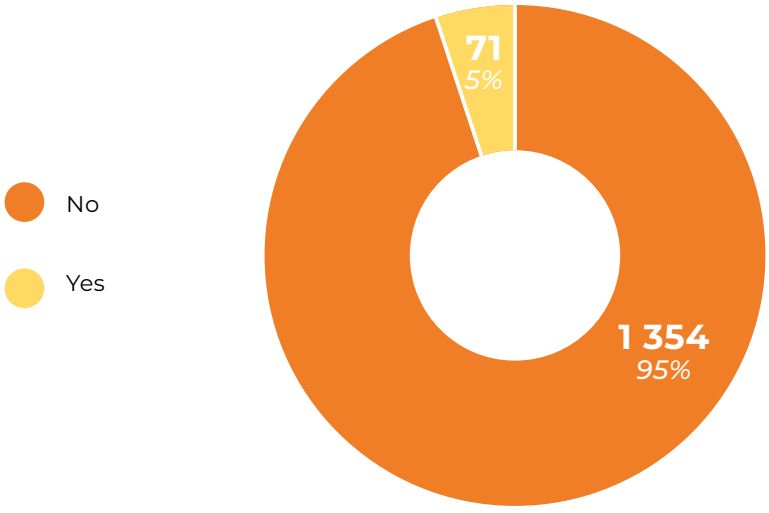


Figure 13

DIARRHOEA IN PREVIOUS 2 WEEKS *(n=1 425)*



3.4. SOCIAL PROTECTION

3.4.1. BIRTH CERTIFICATES

Four percent (n=59) of children under five included in the study did not have a birth certificate. In the under one year old age category, this proportion was 8% (n=24).

3.4.2. REGISTRATION OF CHILD SUPPORT GRANT

Ninety-four percent (n=1 282) of children under the age of five who participated in this study received a Child Support Grant (CSG). In the under one age category, this proportion was 87% (n=230).

Figure 14

CHILDREN WITH BIRTH CERTIFICATES *(n=1 430)*

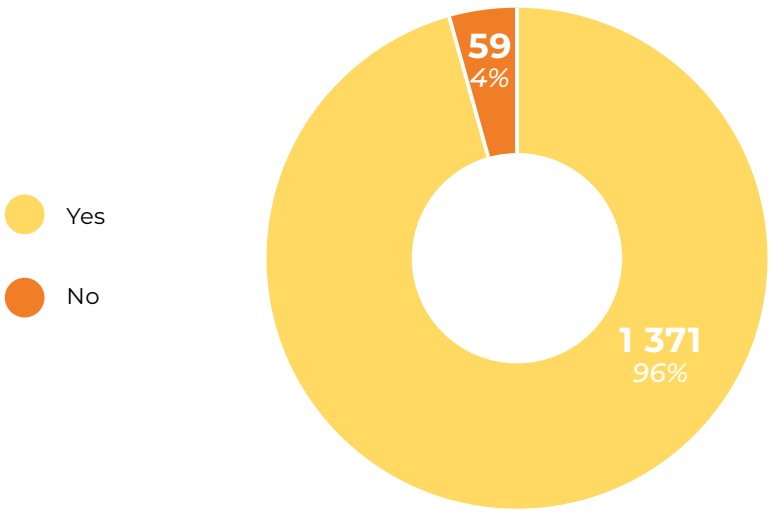
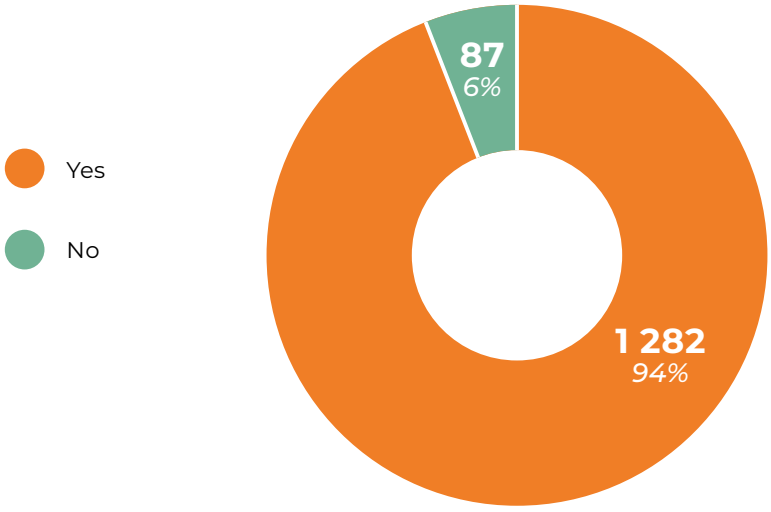


Figure 15

CHILDREN UNDER FIVE YEARS WHO RECEIVED A CHILD SUPPORT GRANT *(n=1 369)*



3.5. ANTHROPOMETRY

3.5.1. LOW BIRTH WEIGHT

Thirteen percent (n=156) of children weighed less than 2500 grams at birth, and therefore would be classified as having had a low birth weight (LBW) reported, *as illustrated in Figure 16.*

3.5.2. ACUTE MALNUTRITION

Mid-upper arm circumference (MUAC) is often used as a community screening tool to identify children at risk of malnutrition. Moderate acute malnutrition (MAM) is defined as having a MUAC between 11.5cm and 12.5cm and severe acute malnutrition (SAM) as a MUAC below 11. 5 cm. In the areas where this study was conducted, 1% (n=20) of children were classified as MAM cases and 1% (n=12) as SAM cases, *as illustrated in Figure 17.*

3.5.3. UNDERWEIGHT AND SEVERELY UNDERWEIGHT (WEIGHT-FOR-AGE)

According to the WHO growth standards, underweight is defined as a having a weight-for-age z-score that is more than two standard deviations below the median. Severely underweight is defined as having a weight-for-age z-score that is more than 3 standard deviations below the median. In this study, 4% (n=54) of children under five were underweight and 1% (n=11) were severely underweight.

3.5.4. WASTING, OVERWEIGHT AND OBESITY (WEIGHT-FOR-LENGTH/HEIGHT)

3.5.4.1. Wasting and severe wasting

According to the WHO's child growth standards, wasting is defined as a child having a weight-for-length/height z-score that is more than two standard deviations below the median. Severe wasting is defined as a child having a weight-for-length/height z-score that is more than three standard deviations below the median. In our study, 1% (n=14) of children under five were found to be wasted and 0.2% (n=3) were severely wasted.

3.5.4.2. Overweight and obesity

A weight-for-height z-score that is more than two standard deviations and more than three standard deviations above the median are both signs of overnutrition and respectively classified as overweight and obesity. Fourteen percent (n=198) of the children included in this study were found to be overweight and 6% (n=91) were obese.

Figure 16

LOW BIRTH WEIGHT *(n=1 189)*

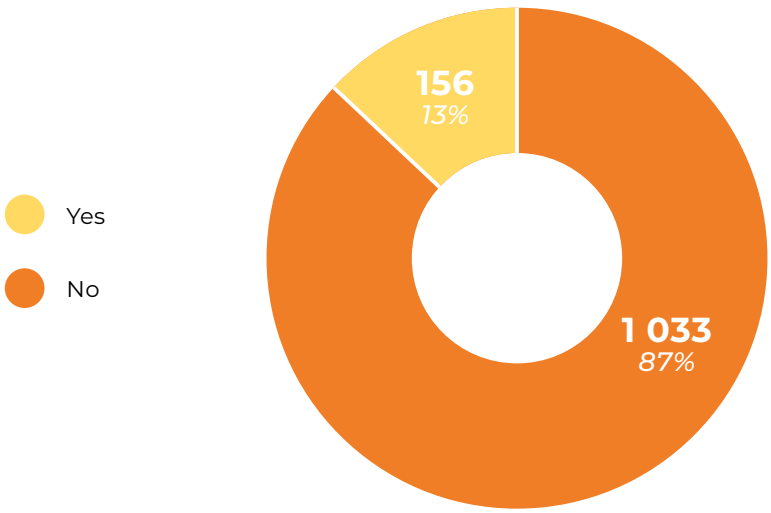
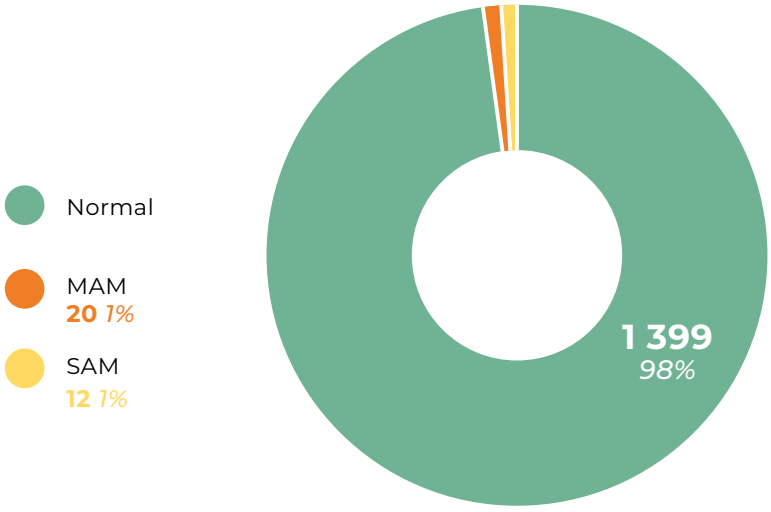


Figure 17

MAM AND SAM *(n=1 431)*



3.5.5. STUNTING

According to the WHO growth standards, children with a height/length-for-age z-score that is more than two standard deviations below the median are considered to be stunted. This means that they have not reached their linear growth potential due to chronic malnutrition, among other reasons. Children whose height/length-for-age z-score is more than three standard deviations below the median are considered to be severely stunted.

In the study population, 24% (n=336; 95% CI= 21%-26%) of children under the age of five were stunted, while 7% (n=94; 95% CI=5%-8%) were severely stunted.

4.
RISK FACTORS FOR STUNTING AND HOW THEY RELATE TO THE STUNTING PREVALENCE IN MQANDULI AND SURROUNDING VILLAGES

4.1. SOCIO-DEMOGRAPHIC INFORMATION

4.1.1. MOTHER'S AGE

Mothers who were between 23 and 34 years old had a 22% higher risk of having children who were stunted compared to mothers between 18 and 24 years old. Mothers between 35 and 64 years old were at 17% lower odds of having children who were stunted compared to mothers between 18 and 24 years old. These odds ratios were not statistically significant.

TABLE 2
MOTHER'S AGE

MOTHER'S AGE	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: 18-24 years	1.00		
23-34 years	1.22	>0.05	0.92-1.61
35-64 years	0.83		0.58-1.19

4.1.2. MATERNAL EDUCATION

Mothers who attended further education after high school, were found to have 54% lower odds of having a child who was stunted compared to mothers who did not study beyond high school. This odds ratio was statistically significant.

TABLE 3
MATERNAL EDUCATION

MOTHER'S EDUCATION	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Below high school	1.00		
Above high school	0.46	<0.05	0.21-0.98

4.1.3. CHILD'S AGE

The odds of being stunted were 28% less for children older than two years of age compared to younger children. This odds ratio was statistically significant.

TABLE 4
CHILD'S AGE

CHILD'S AGE	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: 0 – 23 months	1.00		
24 – 59 months	0.72	<0.05	0.56-0.93

4.1.4. CHILD'S SEX

Boys were found to have increased odds of 30% of being stunted compared to girls. This odds ratio was statistically significant.

TABLE 5
CHILD'S SEX

CHILD'S SEX	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Girls	1.00		
Boys	1.30	<0.05	1.01-1.66

4.2. ACCESS TO BASIC SERVICES

4.2.1. SOURCE OF DRINKING WATER

No child participating in the study had access to piped water in the home. We were therefore unable to assess how the absence of piped water in the home interacts with the prevalence of stunting in this community.

4.2.2. SOURCE OF SANITATION

Children with poor household sanitation were found to be twice as likely to be stunted compared to children whose primary source of sanitation was adequate. This odds ratio was statistically significant.

TABLE 6
SOURCE OF SANITATION

SANITATION	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: No	1.00		
Yes	2.00	<0.05	1.54-2.59

4.3. CHILD HEALTH AND NUTRITION

4.3.1. DEWORMING

Children aged 12 months or older with an incomplete deworming schedule, had 17% lower odds of being stunted compared to children with up-to-date deworming schedules. This counterintuitive finding was not found to be statistically significant.

TABLE 7
DEWORMING

DEWORMING	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Complete deworming schedule	1.00		
Incomplete deworming schedule	0.83	>0.05	0.56-1.22

4.3.2. VITAMIN A SUPPLEMENTATION

Children aged six months or older with an incomplete Vitamin A schedule, had 25% lower odds of being stunted compared to children whose Vitamin A schedules were up to date. However, this counterintuitive odds ratio was not statistically significant.

TABLE 8
VITAMIN A

VITAMIN A RECORD	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Complete Vitamin A schedule	1.00		
Incomplete Vitamin A schedule	1.75	>0.05	0.54-1.04

4.3.3. EXCLUSIVE BREASTFEEDING

Children below the age of six months who were not exclusively breastfed, had 8% increased odds of being stunted compared to children who were reported to be exclusively breastfed. However, this odds ratio was not statistically significant.

TABLE 9
EXCLUSIVE BREASTFEEDING

BREASTFEEDING	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Exclusive breastfeeding	1.00		
Non-exclusive breastfeeding	1.08	>0.05	0.47-2.45

4.3.4. CHILD'S DIETARY DIVERSITY

Children aged six to 23 months who had an inadequate dietary diversity score, had 10% higher odds of being stunted compared to same-aged children with an adequate dietary diversity score. However, this odds ratio was not statistically significant..

TABLE 10
DIETARY DIVERSITY

DIETARY DIVERSITY SCORE	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Adequate dietary diversity score	1.00		
Inadequate dietary diversity score	1.10	>0.05	0.72-1.67

4.3.5. DIARRHOEA

Children who were reported to have had diarrhoea, had 35% lower odds of being stunted compared to children who did not have diarrhoea in the two weeks preceding the survey. However, this odds ratio was not statistically significant.

TABLE 11
DIARRHOEA IN PREVIOUS 2 WEEKS

DIARRHOEA	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: No diarrhoea	1.00		
Diarrhoea	0.65	>0.05	0.34-1.22

4.4. SOCIAL PROTECTION

4.4.1. BIRTH CERTIFICATES

Children under five years of age with no birth certificates were found to be 85% more likely to be stunted compared to those who did have birth certificates. This odds ratio was statistically significant. In the under one year age group, not having a birth certificate increased a child's odds of being stunted by a factor of 2.21. However, this odds ratio was not statistically significant.

TABLE 12
BIRTH CERTIFICATES

BIRTH CERTIFICATES	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Presence of birth certificate (children under five years)	1.00		
Absence of birth certificate (children under five years)	1.85	<0.05	1.07-3.20
Ref: Presence of birth certificate (children under one year)	1.00		
Absence of birth certificate (children under one year)	2.21	>0.05	0.92-5.33

4.4.2. CHILD SUPPORT GRANT

Children under five years of age who were not receiving a Child Support Grant were 85% more likely to be stunted compared to children under five who were receiving grants. For children under the age of one not receiving the Child Support Grant, their risk of being stunted increased by a factor of 2.35 compared to children under age one who were receiving grants. Both these odds ratios were found to be statistically significant.

TABLE 13
CHILD SUPPORT GRANT

CHILD SUPPORT GRANT	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Presence of child support grant (children under five years)	1.00		
Absence of child support grant (children under five years)	1.85	<0.05	1.17-2.92
Ref: Presence of child support grant (children under one year)	1.00		
Absence of child support grant (children under one year)	2.35	<0.05	1.10-5.02

4.5. ANTHROPOMETRY

4.5.1. LOW BIRTH WEIGHT

Children with low birth weight had 2.84 times higher odds of being stunted compared to those with normal birth weight. This odds ratio was statistically significant.

TABLE 14
LOW BIRTH WEIGHT

BIRTH WEIGHT	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Normal birth weight	1.00		
Low birth weight	2.84	<0.05	2.00-4.03

4.5.2. ACUTE MALNUTRITION

Children who screened positive for moderate and severe acute malnutrition had 9.06 and 3.40 higher odds of being stunted respectively, compared to children with an adequate nutritional status (as identified by MUAC). These odds ratios were statistically significant.

TABLE 15
NOURISHMENT STATUS

ACUTE MALNUTRITION	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Adequately Nourished	1.00		
MAM	9.06	<0.05	2.39-34.34
SAM	3.40		1.40-8.23

4.5.3. UNDERWEIGHT AND SEVERELY UNDERWEIGHT (WEIGHT-FOR-AGE)

Children who were found to be underweight were 19 times more likely (OR=18.6) to be stunted compared to children with normal weight. This odds ratio was statistically significant.

TABLE 16
UNDERWEIGHT

WEIGHT-FOR-AGE	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Normal weight	1.00		
Underweight	18.63	<0.05	9.00-38.54
Severely underweight	1.00		

4.5.4. WASTING, OVERWEIGHT AND OBESITY (WEIGHT-FOR-LENGTH/HEIGHT)

Children under five years of age who were wasted had 1% reduced odds of being stunted than children who had a normal weight-for-height z-score. However, this odds ratio was not statistically significant. Children who were overweight were 16% more likely to be stunted than children who had a normal weight-for-height z-score. However, this odds ratio was not statistically significant. Children who were found to be obese had 2.49 higher odds of being stunted compared to those with a weight-for-height z-score. This odds ratio was statistically significant.

TABLE 17
WASTING, OVERWEIGHT AND OBESITY

WEIGHT-FOR-HEIGHT	ODDS RATIO	P VALUE	95% CONFIDENCE INTERVAL
Ref: Normal weight for height	1.00		
Wasting	0.99	>0.05	0.27-3.57
Overweight	1.16	>0.05	0.81-1.66
Obesity	2.49	<0.05	1.60-3.87

4.6. SUMMARY

The risk factors for stunting that were found to be statistically significant *are indicated in Table 18.*

TABLE 18
STATISTICALLY SIGNIFICANT RISK FACTORS FOR STUNTING
IN MQANDULI AND SURROUNDING VILLAGES

RISK FACTORS	ODDS RATIO	95% CONFIDENCE INTERVAL
Male sex	1.30	1.01-1.66
Inadequate access to sanitation	2.00	1.54-2.59
Not having a birth certificate by age five	1.85	1.07-3.20
Not receiving a Child Support Grant by age five	1.85	1.17-2.92
Not receiving a Child Support Grant by age one	2.35	1.10-5.02
Low birth weight	2.84	2.00-4.33
Moderate acute malnutrition (MAM)	3.40	1.40-8.23
Severe acute malnutrition (SAM)	9.06	2.39-34.34
Underweight	18.63	9.00-38.54
Obesity	2.49	1.60-3.87

The factors that were found to have a protective effect against stunting *are indicated in Table 19.*

TABLE 19

STATISTICALLY SIGNIFICANT PROTECTIVE FACTORS AGAINST STUNTING IN MQANDULI AND SURROUNDING VILLAGES

RISK FACTORS	ODDS RATIO	95% CONFIDENCE INTERVAL
Maternal education	0.53	0.34-0.82
Child age (24-59 months)	0.73	0.56-0.93

After controlling for confounding variables, underweight (adjusted OR=16.97, 95% CI[3.55-81.11]) remained predictive of stunting. Having reportedly had diarrhoea in the past two weeks, counterintuitively emerged as protective of stunting (adjusted OR: 0.20, 95% CI[0.05-0.83]).

5. DISCUSSION

5.1. SOCIO-DEMOGRAPHICS

5.1.1. MATERNAL EDUCATIONAL ATTAINMENT

Having attended education after high school was found to be protective against stunting in this study. This was a statistically significant finding. Children whose mothers had an education level beyond high school were found to have lower odds of being stunted than children whose mothers did not. This finding is consistent with literature from other African countries and global settings,[16–20] that maternal education attainment is protective against stunting. Most mothers (92%) included in the study did not study beyond high school. This is not unique to Mqanduli but is typical of the South African experience i.e. that women living in disadvantaged communities such as those included in this study are likely to have poorer education outcomes than their counterparts living in privileged communities[21] and parallels what was found in a similar study conducted in Worcester in the Western Cape.[22] This is a grave injustice, not only for the woman who herself is denied the opportunity to participate in the South African formal economy (the absence of Grade 12 or tertiary education is associated with higher unemployment),[23] but also for the child who is at a greater risk of stunting and its long-term consequences, in part as a result of his/her mother being structurally unsupported to achieve a high school level education. As stunting itself has long-term consequences on the educational attainment of the child, this serves to trap families in intergenerational cycles of poverty.[3]

5.1.2. CHILD'S AGE

Children between zero and 23 months old i.e. under two years old, were found to be at an increased risk of stunting compared to their 24- to 60-month-old counterparts. This is consistent with what has been reported in the international literature[24,25] i.e. the First 1000 Days of life are a period of particular vulnerability to stunting.

5.1.2. CHILD'S SEX

Boy children were found to have increased odds of being stunted compared to girl children. Boy children typically fare worse than girl children across a range of childhood illnesses.[26] Female children seem to have stronger immune response to infection, which may account for why boy children are sicklier.[27]

5.2. ACCESS TO BASIC SERVICES

5.2.1. WATER AND SANITATION

Twenty-seven percent (27%; n=390) of children in this study population lived in households that did not have access to adequate sanitation. This is almost double what has been reported at provincial level.[12] These children were found to be twice as likely to suffer from stunting than children who lived in households that had access to adequate sanitation. This finding supports what has been argued in the literature i.e. that poor household sanitation is predictive of stunting among young children.[28]

Not a single study participant had access to an adequate source of drinking water. This is significantly lower than provincial reports that 52% of households in the Eastern Cape are without piped water in the home.[12] We were unable to assess the relationship between stunting and poor access to an adequate drinking water source as there was no counterfactual to compare with. We know, however, from the work of others that poor WASH (water, sanitation and hygiene) conditions place children at increased risk of microbial ingestion, which in turn results in environmental enteropathy (asymptomatic inflammatory disorder of the small intestine that impairs nutrient absorption)[29] or diarrhoeal disease that leads to chronic malnutrition and stunted growth.[30] Checkley et al. in their multi-country pooled analysis of nine cohort studies found that five diarrhoeal episodes in the first two years of life, increased a child's odds of suffering from stunting by a factor of 1.13 (95% CI 1.07-1.19).[31] It is therefore likely, based on this evidence and similar work of others, that the poor WASH conditions in this community contributed to the high stunting prevalence rates found in the study population.

5.3. CHILD HEALTH AND NUTRITION

5.3.1. DEWORMING AND VITAMIN A COVERAGE

Although both deworming and Vitamin A coverage were suboptimal in our study population, there were no statistically significantly associations found between poor deworming or low Vitamin A coverage and increased odds of stunting.

5.3.2. EXCLUSIVE BREASTFEEDING

Thirty-seven percent (37%; n=44) of children under six in Mqanduli were reported to be exclusively breastfed. This figure is a slight improvement on the provincial rate and national rates of 32%. There was, however, no

statistically significant relationship found between exclusively breastfed children and the odds of suffering from stunting.

5.3.3. VITAMIN A COVERAGE

Although Vitamin A coverage were suboptimal in our study population, it was not found to be statistically significantly associated with higher odds of being stunted.

5.3.4. CHILD'S DIETARY DIVERSITY

High dietary diversity scores have been found to be positively associated with the nutritional status of children, particularly higher height-for-age scores.[15] Forty-three percent of children between six and 23 months old participating in this study were found to have an inadequate dietary diversity score, suggesting that they were not receiving an adequately varied diet at the time of the research. However, in this study population, there was no statistically significant relationship found between having a low dietary diversity score and increased odds of suffering from stunting.

5.3.5. DIARRHOEA

Five percent (5%) of children were reported to have had diarrhoea i.e. three or more watery or loose stools in the two weeks prior to the study. Diarrhoea counterintuitively emerged in the multivariate analysis as having a protective effect against stunting in this study population. This is likely to be a spurious finding, possibly attributable to the small proportion of children reported to have suffered from diarrhoea.

5.4. SOCIAL PROTECTION

5.4.1. BIRTH REGISTRATION

Most children (96%) included in the study had birth certificates. The 4% who did not have birth certificates, however, were found to have a statistically significant 85% increased odds of suffering from stunting compared to children under five who did possess a birth certificate. Children are unable to access social protection services, such as the Child Support Grant, in the absence of a birth certificate. It is therefore not surprising that children who were reported to not have a birth certificate were found to be more vulnerable to stunting.

5.4.2. ACCESS TO CHILD SUPPORT GRANT

Most children (94%) included in the study were receiving a Child Support Grant. However, in the under one year old age category, only 87% of children were receiving the Child Support Grant. Children aged under five years who were not receiving Child Support Grant were found to be almost twice as likely to suffer from stunting compared to children who were receiving grants. This odds ratio increased to almost 2.5 times in the under one age category. Both of these odds ratios were found to be statistically significant and support the literature that finds that South Africa's Child Support Grant contributes to improving child nutrition, including improved height-for-age z-scores.[32,33]

5.5. ANTHROPOMETRY

5.5.1. STUNTING

Twenty-four percent (24%) of children under five included in this study suffered from stunting. The prevalence of stunting found in this community was very slightly lower than provincial and national estimates of 25% and 27% respectively.[5]

5.5.2. LOW BIRTH WEIGHT

Thirteen percent (13%) of children had a low birth weight, which parallels provincial trends of 13.6%.[34] Having a low birth weight in this population was found to increase the odds of a child being stunted by nearly three times. This highlights the importance of maternal nutrition interventions beginning in pregnancy. At present in South Africa, State social assistance for the purposes of nutrition support for vulnerable and poor children is only provided after the child is born in the form of the Child Support Grant. South Africa does not provide this kind of support to vulnerable and poor pregnant women. This is a missed opportunity because, as has been demonstrated in this study, much of the vulnerability to stunting begins in pregnancy.

5.5.3. UNDERNUTRITION

The study population had low levels of both moderate and severe acute malnutrition (as screened for on MUAC measurement) at 1% for both. Children who screened positive for moderate and severe acute malnutrition had 9.06 and 3.40 higher odds of being stunted respectively, than children with an adequate nutritional status (as identified by MUAC). These odds ratios were statistically significant. The prevalence of weight for age of more than two standard deviations below the median, was slightly higher, with underweight estimated at 4% for the

study population. This is similar to what has been reported for the Eastern Cape more broadly (estimated 3%).[5] Underweight children were almost 17 times more likely to be stunted compared to children who had a normal weight for age, even after adjusting for confounding factors.

Related to undernutrition, 2% of children were found to be wasted and 0.2% were found to be severely wasted. No statistically significant relationship between wasting and stunting was established in this study population.

5.5.4. OVERNUTRITION

Fourteen percent (14%) of children included in this study were found to be overweight, an improvement upon provincial estimates of 21%. Although being overweight was found to increase a child's odds of suffering from stunting, this was not found to be a statistically significant relationship. Six percent (6%) of children in the study population were found to be obese and these children had a statistically significant 2.5 times increased likelihood of being stunted compared to children of normal weight.

5.6. LIMITATIONS

Some questions relied on participants' memory of past events. Self-reported data can lead to recall and social desirability bias. Questions about immunisation schedules were imprecisely phrased, making it difficult for researchers to interpret this data and draw conclusions from it, thereby resulting in these specific data being left out of the analysis. Future community-based surveys will improve upon these design elements. Nonetheless this study makes an important contribution to the limited empirical literature on the nutritional status of South Africa's children.

6. CONCLUSION AND RECOMMENDATIONS

Poor maternal education in this study population was found to increase the odds of a child being stunted. This is in line with research evidence.[16–20] Almost all the mothers (92%) participating in this research only attended up to a high school level education – and it is unclear how many actually completed.[35]

Addressing the poor access to adequate water and sanitation in this community is critical to reducing the prevalence of stunting. Research has also found that dietary interventions alone cannot eliminate stunting in communities, and that it is through the combination of dietary interventions, behaviour change support and improved access to adequate water and sanitation where significant gains on stunting are made.[28,30] Ultimately, the elimination of stunting requires a multisectoral response.

Children in this study who were found not to possess a birth certificate were found to be at greater risk of stunting. Similarly, children in the under five years old age category who were not benefitting from Child Support Grants were found to be twice as likely to be stunted than children who were receiving the CSG and this odds ratio increased to 2.5 times in the under one year old age category. This finding speaks to the need to strengthen CHW-led home visiting programmes to ensure that all children in this community, and similarly vulnerable communities in the Eastern Cape, are benefitting from social protection services available to them through the state. CHWs should be trained and empowered to identify and support families who have children without birth registration documents to access these. Similarly, CHWs should be trained and empowered to identify and refer eligible children not receiving the CSG to access this benefit. This is particularly important in light of the extensive research evidence that finds that the CSG not only contributes to improving children's height-for-age scores, but their education outcomes as well, serving to help break intergenerational cycles of poverty.

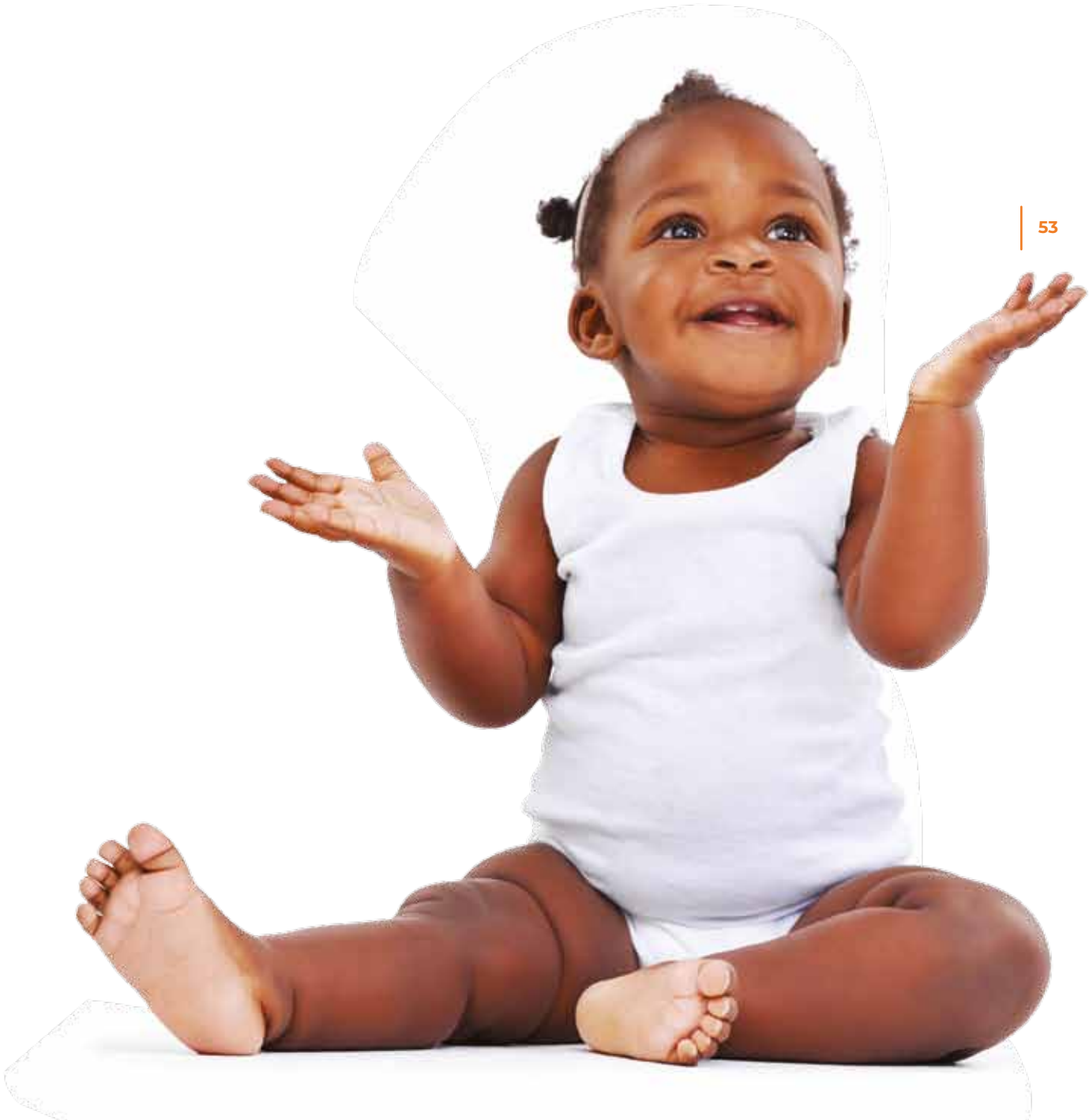
Mqanduli had a high prevalence of stunting (24%) in children under five years of age, akin to the provincial and national prevalence rates of 25% and 27% respectively.[5] This high prevalence of stunting is coupled with high levels of low birth weight. In this study low birth weight was found to increase the odds of a child being stunted by almost three times. This suggests that much of the

disadvantage that puts children at risk of eventually becoming stunted, starts in pregnancy and so pre-pregnancy and antenatal focussed interventions that support women during this critical time need to be prioritised in the Mqanduli community. This further speaks to the need to extend State social protection programmes, such as the Child Support Grant, into pregnancy. In addition to the stunting problem, 2% of children screened positive on MUAC measurement for acute malnutrition and 4% of children in Mqanduli were found to be underweight. Children who screened positive for moderate acute malnutrition were found to have an approximately three times increased risk of stunting compared to their peers who had a normal MUAC measurement and those who screened positive for severe acute malnutrition were found to have about a nine times increased risk of stunting.

Related to undernutrition, 4% of children in the study population were found to be underweight and 1% severely underweight. Although these proportions were small, these children were found to be 17 times more likely to suffer from stunting than their peers with normal weight, even after adjusting for confounding variables such as male gender, maternal education and access to basic services. Addressing underweight in the Mqanduli community should be a matter of priority because, as this research suggests, it independently increases the risk of stunting even after accounting for social circumstances and biological differences. Furthermore, CHWs should be equipped with scales and trained in the early identification of growth faltering in the home, so that children who are not growing well and who require additional support are referred timeously. At present, CHWs are typically only equipped with MUAC tapes. Research suggests that if children are only screened for mid-upper arm circumference and not routinely weighed, many children who are growth faltering will be missed.[22,40] For example, in our study, 4% of children with normal MUAC were found to be underweight and 22% were found to be stunted.

The research also found that Mqanduli is experiencing a double burden of both under- and overnutrition, with 14% of children under five in this study found to be overweight and 6% obese. Children who were found to be obese had a 2.5 times increased risk of simultaneously being stunted compared to children of normal weight. Although the overweight prevalence of 14% is lower than provincial estimates of 21%, it is higher than national averages[5] and puts children at long-term risk of non-communicable diseases such as heart disease and diabetes.[41] Parent support and nutrition education programmes need to be rolled out in the Mqanduli community to empower parents and other primary caregivers to provide healthy meals to their children, in addition to improving coverage of social assistance. Given the high rates of unemployment and poverty, the responsibility cannot be solely that of the primary caregivers. 'Double duty' interventions such as supporting mothers to exclusively breastfeed for the first six months of their child's life – which is protective against both under- and overnutrition – should also be strengthened.[42]

This study presents evidence for where local and provincial government strategies aimed at reducing stunting in Mqanduli specifically, but also in similar communities in the Eastern Cape, should be targetting their activities. In light of the child nutrition-related setbacks that Covid-19 has placed on communities, it is critical that programmes and policies be informed by evidence and focussed on cost-effective interventions that have been shown here, and in other studies, to significantly reduce stunting and bring us closer to a future where no child is denied the opportunity to reach their full potential from a preventable condition.



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APPENDIX 1:
MQANDULI & SURROUNDING VILLAGES STUNTING QUESTIONNAIRE

QUESTIONNAIRE

PARTICIPANT NO: GG.....
VISIT NO:
AREA:
CLINIC:

COMPLETED BY:
(Fieldworkers' names)
SUPERVISED BY:
(Supervisor's names)

Title of research project:
A STUNTING PROFILE OF CHILDREN YOUNGER THAN FIVE YEARS IN FOURTEEN FOOD INSECURE COMMUNITIES ACROSS SOUTH AFRICA

DATE:

SECTION 1:
HOUSEHOLD SOCIO-DEMOGRAPHIC INFORMATION

INSTRUCTIONS:

This questionnaire needs to be completed by a trained field worker, after obtaining written consent from the mother of an infant/child eligible for inclusion in the study. All answers must be filled in. Obtain this information from the mother or care giver if the mother is not present.

A1. Are you the mother of the child?	Yes / No
A2. What is the mother's date of birth? *(this information can be verified from records in the child's Road-to-Health booklet or the mother's identify document)*	dd/mm/yy
A3. What is the highest level you attended: primary, secondary or higher than secondary?	___Primary ___Secondary ___Higher than secondary ___Other
A4. Does your household have electricity that is connected to the mains?	Yes / No

SECTION 2:
WATER AND SANITATION

A5. What is the main source of drinking water for this household?	____Piped water (in the house) ____Communal water ____Dam/River/Spring ____Rain water ____Other ____Don't know
A6. What is the main form of sanitation for this household?	____Flush toilet ____Pit latrine (long drop) ____Ventilated pit latrine ____Portable toilets ____No facilities ____Other ____Don't know

SECTION 3:
INFORMATION ON THE CHILD

INSTRUCTIONS:

Check the child's Road to Health Booklet for questions B1 to B7.

B1. Do you have the Road-to-Health-Booklet) for your baby? *If NO: Refer to the clinic to get a new book*	____Yes ____No ____Yes, but not available ____Don't know ____Refused
B2. What is your baby's birth date? *(This information can be verified from the child's Road-to-Health booklet or birth certificate)*	dd/mm/yy
B3. What was your baby's birth weight? *(This information can be checked in the child's Road-to-Health booklet)*	____Kg ____g
B4. When was the last immunisation given?	dd/mm/yy ____No Road to Health Booklet ____Not completed ____Not applicable
B5. In the last six months was your child given a Vitamin A dose? *Refer the child to the clinic if the Vitamin A supplementation is not up to date.*	Yes / No
B6. Was your child given any drug for intestinal worms in the last six months? *Refer the child to the clinic if deworming is not up to date.*	____Yes ____No ____Not applicable
B7. Is the baby a boy or a girl?	Boy / Girl
B8. Has your child had 3 or more loose or watery stools per day in the past two weeks? *(If the child is currently still experiencing diarrhoea, refer to local health facility)*	____Yes ____No ____Don't know

B9. Does the child have a birth certificate?
Refer to the Department of Home Affairs if NO

____Yes
____No
____Don't know
____Not applicable

B10. Does the child receive a Child Support Grant?
Refer to the SASSA if NO

____Yes
____No
____Don't know
____Not applicable

SECTION 4:
INFANT AND YOUNG CHILD HEALTH AND NUTRITION

INSTRUCTIONS:

This section should only be asked for children aged 6 months and younger.
Go to Section 5 if the child is older than 6 months.

C.1.1 What has your baby received to drink / eat today? Tick all the applicable answers.

C.1.2 If other, please indicate full details below.

_____ Breastmilk
_____ Formula
_____ Water
_____ Juice
_____ Yoghurt
_____ Soft porridge
_____ Other (please give details)

C.3.1 If receiving formula or any drinks other than breastmilk:

C.3.1.1 At what age was this food/drink first given to the baby?

_____ days
_____ weeks
_____ months
_____ don't know

C.4.1 If you have breastfed the baby at any time and are no longer giving him/her breastmilk, give reason/s for this decision?

_____ not enough milk
_____ advised to discontinue by family member
_____ advised to discontinue by a health worker
_____ baby doesn't want to take breastmilk
_____ painful
_____ HIV status
_____ other (please specify)

C.4.2. If you no longer breast feed your baby, at what age did you stop giving your baby any breastmilk? Skip this question if the baby never receive breastmilk.

_____ days
_____ weeks
_____ months

SECTION 5: INFANT AND YOUNG CHILD MINIMUM DIETARY DIVERSITY

INSTRUCTIONS:

Mark with an √ if the child did receive the food types yesterday.
Mark with an X if the child did not receive these foods types yesterday.

D.1. Which of the following types of food did your baby receive yesterday?

_____ grains (maize, pap, cereal, bread, rice, samp)
_____ beans, lentils or nuts
_____ dairy products (milk, yogurt, cheese, amasi), excluding breastmilk
_____ flesh foods (meat, fish, poultry and liver/organ meats)
_____ eggs
_____ vitamin-A rich fruits and vegetables (e.g. sweet potato, carrots, pumpkin, spinach, broccoli, apricot, peach, mango)
_____ other fruits and vegetables (list)

SECTION 6:
GROWTH MONITORING

INSTRUCTIONS:

A third measurement needs to be taken if the difference between the first and second measurement is more than 0,5cm. This applies to the measurements of weight, height/ length or mid-upper arm circumference (MUAC).

Do the following measurements for the child:

MEASUREMENT TYPE	MEASUREMENT 1	MEASUREMENT 2	MEASUREMENT 3
Weight in KG	E1.1 _____	E1.2 _____	E1.3 _____
Height/length in CM	E1.4 _____	E1.5 _____	E1.6 _____
Mid-upper arm circumference in CM	E1.7 _____	E1.8 _____	E1.9 _____

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